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OBSERVATIONS ON CALP.

By the Honourable GEORGE KNOX, *M. R. I. A.*

AS the Academy has evinced a deſire to promote mineralogical enquiries in the county of Dublin; I take the liberty of ſubmitting to it the analyſis of a mineral which abounds in the neighbourhood of the metropolis, and which our celebrated Preſident has diſtinguiſhed by the name of Calp. (vid. Kirwan's Elements of Mineralogy, vol. I. p. 233.)

Read, March 9, 1801.

CALP, or black quarry ſtone of Dublin, is placed, in Mr. Kirwan's Elements of Mineralogy, under the argillaceous genus; being a ſubſtance which poſſeſſes the diſtinctive characters of that earth more than any other. For, although it efferveſces with acids and ſcratches glaſs, it neither burns to lime nor gives fire with ſteel. Whilſt on the other hand it emits, when breathed upon, the ſmell peculiar to argillaceous earth.

THE quantity of argill, however, which its chemical analyſis diſcovers, would ſcarcely, were its internal properties to determine its claſs, entitle it to rank in that which Mr. Kirwan has aſſigned to it.

The external characters and leading properties of the ſpecimen which I uſed were the following:

Colour—Greyiſh black, inclining to blue.

Lustre—o

Transparency—o

Hardness—Scratched glaſs with difficulty, crumbling at the ſame time.—Did not give fire with ſteel.

Fracture—Lateral fracture imperfectly conchoidal—Tranſverſe fracture ſlaty, paſſing into the coarſe-grained earthy.

Gave a white ſtreak.

Effervesced with acids.

Gave an earthy ſmell when breathed on.

When calcined did not flake.

Colour, when calcined, a yellowiſh grey.

Cracked, and flew into thin ſlates, when expoſed to a low heat in an open fire.

Specific gravity, at the temperature of 66 Fahrenheit 2. 68.

CHEMICAL

CHEMICAL ANALYSIS.

One hundred parts contain the following ſubſtances in nearly the proportions annexed:

Carbonate of lime - -	68
Oxyd of iron - - -	2
Argill - - - -	$7\frac{1}{2}$
Silex - - - -	18
Carbon and Bitumen - -	3
Water - - - -	$1\frac{1}{2}$

The proceſs by which a mineral ſubſtance, of the nature of that which is the ſubject of this paper, is analyſed, is ſo ſimple, and well known, as almoſt to render any detail of the operation unneceſſary. More than one analyſis was made. The muriatic and acetous acids were ſeverally uſed to take up the carbonate of lime; but the former diſſolved the iron alſo. The metal was precipitated from the muriatic ſolution by pruſſiate of pot-aſh, and the lime ſeparated from each by carbonate of pot-aſh. The argill was extricated with difficulty, by long digeſtion and boiling in ſulphuric acid, and precipitated by carbonate of ſoda.—Beſides the general analyſis, each ingredient was ſeparately collected from diſtinct portions, of 100 grains each, of the ſpecimen.

The

THE following are my reaſons for ſuppoſing that the iron was in the ſtate of an oxyd, and that the principal colouring matter was compoſed of carbon and bitumen.

WITH a view of diſcovering whether the iron was in its metallic ſtate, or otherwiſe, in the ſtone, a large quantity of it, amounting to ſeveral hundred grains, was treated with muriatic acid, and the gas which was extricated was paſſed through water, and caught in a pneumatic apparatus.

THE ſame proceſs was repeated, with the ſubſtitution of the ſulphuric for the muriatic acid. In both caſes the reſult was the ſame.—No hydrogen gas could be collected; but, when the whole of the carbonic acid had been imbibed by the water, there remained, in the veſſel, a ſmall quantity of azotic gas.

THAT the dark colour of the ſtone could not be produced merely by the oxyd of iron, I was naturally led to ſuſpect from the change produced in it by calcination. I therefore ſatisfied myſelf on that point, by carefully ſeparating from a portion of the ſtone every particle of the metal, a proceſs which produced no change in its colour.

AS it appeared now pretty evident that the calp contained ſome inflammable matter, to which it was indebted for its dark colour, I endeavoured to eſtimate its proportion by the following proceſs:

THIRTY

THIRTY grains, from which all the carbonate of lime and oxyd of iron had been previouſly extracted, were dried in a cloſe veſſel, and in ſuch a heat as ſeemed ſufficient to expel the water, and afterwards calcined. By the calcination the powder was rendered white, and loſt that proportion of its weight which I aſſign in the reſult of the analyſis to the carbon and bitumen.

STILL, however, it remained to determine in what ſtate, whether of carbon or of bitumen ſingly, or whether of a mixture of both, the inflammable colouring matter exiſted in the mineral.

ON the ſuppoſition that it was merely carbon in a ſtate of extreme diviſion, it was boiled (the lime, argill and iron having been previouſly ſeparated) in concentrated nitrous acid. By this treatment the intenſity of the colour was ſomewhat diminiſhed, and a ſmall quantity of nitrous air was produced.

THE next attempt was to ſeparate the bitumen, ſuppoſing that it contained any.—To effect this, a large quantity of the powdered calp was boiled in cauſtic pot-aſh, filtered and edulcorated; but as the reſiduum on the filtre retained the original colour, it conſequently could not have been entirely produced by bituminous matter.

THAT it contained, however, *ſome* bitumen, ſeems pretty evident; for, having evaporated the filtered ſolution to dryneſs, and diſſolved

diſſolved the dried reſiduum in muriatic acid, an oily matter floated on the ſurface of the liquor.

From theſe experiments I have ventured to aſſert, that the colouring matter is compoſed, in proportions which I have not been able to aſcertain, of a mixture of bitumen and carbon.

With reſpect to the azot I am unable to form any ſatisfactory conjectures of its origin. Might it not have proceeded from the body of the animal whoſe ſhell had contributed the carbonate of lime to the formation of the maſs?

The following facts may aſſiſt enquiries upon this ſubject:

Calp is found in great quantities in the neighbourhood of Lucan; and the quarries from which it is dug generally exhibit the following appearance:

Immediately under the vegetable mould is a thin bed of lime-ſtone gravel; beneath which, to a conſiderable depth, are ſtrata of dark lime-ſtone, ſeparated from each other by beds or layers of argillaceous ſhiſtus. The deeper the quarry is dug, the nearer the lime-ſtone ſeems to approach to the nature of calp; to which it at length arrives, by a gradual and ſcarcely perceptible tranſition.

In the grounds of Edmondſbury, ſcarcely one mile from Lucan, there is a ſpring, called by the common people the Boiling Well, which

which is of a ſomewhat higher temperature than the neighbouring ſprings, and from the bottom of which are continually riſing large bubbles of pure azotic gas.

In an analyſis, which I ſometime ſince attempted, of the Lucan water, I found that azotic as well as hydrogen gas eſcaped from it at a boiling heat; a circumſtance which could hardly have been occaſioned by the decompoſition of atmoſpheric air held in ſolution in the water, as no ſulphuric or ſulphureous acid was produced, as was to be expected from the ſimultaneous decompoſition of ſulphurated hydrogen gas and atmoſpheric air.

It may alſo be worth obſerving by perſons who are deſirous of proſecuting this enquiry farther, that in moſt of the lime-ſtone in that neighbourhood, which contains ſhells, is to be found ſulphurated hydrogen.

And, likewiſe, that after evaporating the Lucan water to dryneſs, a ſmall quantity of a fetid bituminous matter, ſoluble in alcohol, remains mixed with the earths and ſalts.

On theſe few facts I ſhall not preſume to form a theory—Neither do I offer them as ſubjects for ſpeculation, but as an encouragement to further and more accurate reſearches.

Note.—As I believe that my analyſis of the Lucan water is a nearer approximation to the truth than any hitherto publiſhed, and perhaps ſufficiently accurate for medical purpoſes, I ſhall here ſubjoin it.—To thoſe who are acquainted with the difficulties attending the inveſtigation of the ingredients of an hepatic water, it will not afford any ſurpriſe that I ſhould offer the reſult of mine with diffidence.

LUCAN WATER, TWO GALLONS.

	GRAINS.
Carbonate of magneſia -	1½
Carbonate of lime - -	23
Carbonate of ſoda - -	39
Muriate of ſoda - -	4
Sulphur - - -	16
Bitumen - - -	

The carbonate of lime is held in ſolution by an exceſs of carbonic acid, amounting to about 32 cubic inches in two gallons of the water.—The ſulphur is in the ſtate of ſulphurated hydrogen.